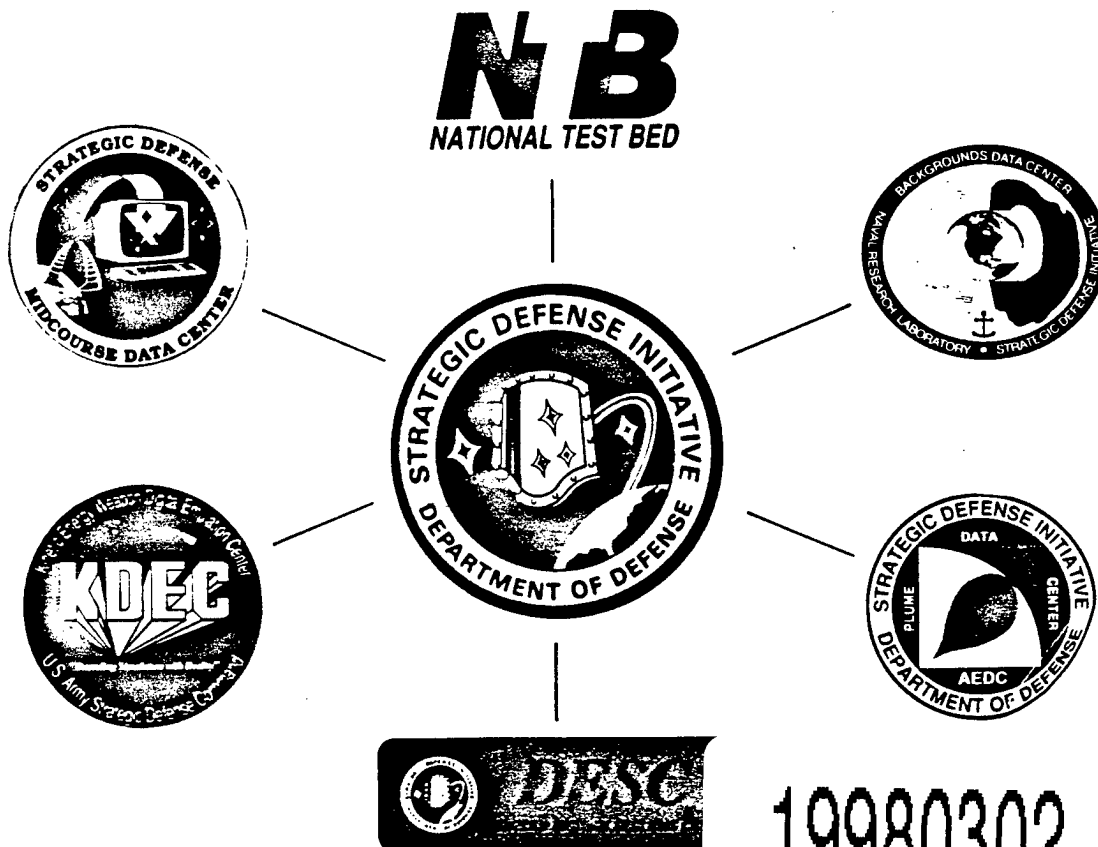


STRATEGIC DEFENSE INITIATIVE ORGANIZATION (SDIO) DATA CENTER OVERVIEW



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Strategic Defense Initiative Organization
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by
Photon Research Associat

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Experiment Science Engineering Test

Measure Store Access Distribute STDC

Phenomenology Technology Midcourse

Background Plume KEW DEW NTF BDC PDC

KDEC DESC MDC

FORWARD

This document was prepared as a guide to the nature and responsibilities of the SDIO data archival centers. These facilities were developed and sponsored by the Technology Deputate to act as nodes for concentration and maintenance of information derived from SDI demonstrations and experiments. If you require additional information about any or all of the centers, you may contact either the respective center managers or Capt Barry Tilton, the manager of the three Phenomenology Data Centers, at (703) 695-8830.

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SDIO DATA CENTER OVERVIEW

DATA CENTER CONCEPT

The Strategic Defense Initiative Organization (SDIO) program experiments generate significant quantities of science and engineering data. To protect the large investment made in collecting the resulting test and measurement data SDIO has established data centers to manage the storage, access, and distribution of this information. These data centers provide experimenters, developers, scientists, and analysts access to databases of reduced, verified and validated experiment data at institutions with the expertise to support their data requirements.

The SDIO science and technology data centers (STDC's) are located at existing DoD centers of expertise relating to science phenomenology and technology. Three phenomenology data centers handle information such as earth and space backgrounds, missile plume signatures, and reentry vehicle information. Two engineering and technology data centers manage information about kinetic energy weapons and directed energy weapons. A sixth data center, the National Test Facility (NTF), serves as a coordinating data center for technical issues and is the center of the National Test Bed (NTB). To assure that the data centers adequately serve the needs of the SDIO community, the User Products Information Group (UPIG) coordinates activities among the data centers and the Data Center Standards Committee (DCSC).

While the data centers serve primarily as archival facilities for data collected during the SDIO program experiments, they engage in many other support activities. STDC's serve a large scientific community by providing on-line access to much of the experiment data, and by providing on-site expertise to assist users with their data requirements. Additionally, the data centers serve as a supplementary source of expertise relating to the nature of the data and the particular programs from which they receive data. As a result the data centers have the ability to reprocess, recalibrate, and/or perform secondary analysis on the data as required. Each data center makes available support personnel to assist the user community and maintain hardware and software in support of user requirements in addition to standard data processing services.

The data center manager and data center personnel work with the appropriate groups to determine standards, availability, post-processing, and storage media for most of the data. The SDIO Data Center Standards Committee is the primary group addressing issues of standardization among the data centers. Information groups provide a forum for communications between the users, data centers, DCSC, and other interested parties. This approach helps address interoperability among the STDCs. Though the STDC's each have their core responsibilities relating to particular program experiment support, they are designed to share data, knowledge, and resources. Interoperability is achieved through common data transfer techniques, data access strategies, compatible software and hardware, and a common master catalogue and data dictionary.

The SDIO data centers store "user data"; data that have undergone reduction, verification, validation, preliminary analysis, and database organization. The data have been organized into

databases and have detailed catalogs to assist with the extraction of specific data. The catalog also maintains an inventory of available data. Furthermore, the data are under the control and management of an appropriate database management system (DBMS) and are available to the user via a DBMS access language. The users extract "views" of the data relative to their requirements.

The data centers ultimately serve as points of archive for SDIO phenomenology and engineering experiment data, and in combination they provide a complete repository for the accumulated data. Since the data centers are not co-located there must exist compatible hardware, software, and communications facilities for the secure and efficient transfer of data among the different centers such that data are not logically isolated to any one data center. The data that are archived by the data centers comprise what may be termed a "collective database" or "distributed database" (a single logical database view made up of smaller geographically distributed databases), and will be referred to as the SDIO Science and Technology Database (STDB). Thus, the SDIO experiment data physically reside in many locations. Conceptually, this should not create any problems if the proper cross referencing and descriptive entries are made in a master catalogue, the individual data center catalogues, and in the DBMS(s) data dictionary(s). From the STDB information can be extracted, analyzed and interpreted to provide guidance and assistance in the decision process associated with Strategic Defense System (SDS) feasibility, development, and implementation by the SDIO.

DATA CENTER DESCRIPTION

There presently exist six data centers actively processing data associated with the STDB: three phenomenology data centers; two technology engineering data centers; and the National Test Facility. Figure 1 shows the locations of the different data centers. Figure 2 gives an organization chart for SDIO data center management. APPENDIX A provides a data management contacts list that includes contact names, mailing addresses, and phone numbers.

Phenomenology Data Centers-

Midcourse Data Center (MDC) - The MDC contains data extracted from experiments associated with the trajectory of a ballistic missile between the boost/post boost phase and the terminal/reentry phase, and occurring outside the earth's atmosphere. The Midcourse Data Center began operations in August, 1988 evolving from the Vector Experiment Data Archive. Examples of experiment data collected and stored at this facility are DELTA 181, JANUS 1 PRIME, and QUEEN MATCH. The MDC is located in Huntsville, Alabama at the U.S. Army Strategic Defense Command (USASDC) Advanced Research Center (ARC).

Backgrounds Data Center (BDC) - The BDC primarily houses experiment data relating to space, atmosphere, and terrestrial background scenes. For example, a digital depiction of a cloudy sky. The Backgrounds Data Center became operational in September, 1989 and will have VUE and TCE for its first set of

data for distribution. The facility is located at the Naval Research Laboratory (NRL) in Washington, D.C.

Plume Data Center (PDC) - The PDC archives and distributes missile plumes data, for example, infrared imagery of an ICBM plume during the boost phase of the missile's flight. The Plume Data Center will become operational in January, 1991, but already manages missile plume data from SDIO aircraft measurements, altitude chamber measurements, ground launch measurements, and Delta 180 and Delta 181 experiments. The PDC is located at the Arnold Engineering Development Center (AEDC), Arnold Air Force Base, Tennessee.

Engineering Data Centers-

Kinetic Energy Weapon Digital Emulation Center (KDEC) - The KDEC is responsible for the storage and dissemination of engineering data related to kinetic energy weapon experiments and research, for example, free flight stability data collected during the Kinetic Kill Vehicle Hover Interceptor Tests (KHIT). The KDEC is located at the USASDC Simulation Center in Huntsville, Alabama.

Directed Energy Systems Center (DESC) - The DESC archives and distributes directed energy data such as accuracy information on Ground Based Laser (GBL) Boost Phase Intercept. It also serves as a science operations center for directed energy (DE) field experiments. The DESC is located at Falcon Air Force Base, near Colorado Springs, Colorado.

National Test Facility -

National Test Facility (NTF) - The NTF is the hub of the National Test Bed and is responsible for: 1) coordinating an orderly process for the remote access of data center information; 2) providing secure data communications among the data centers and other designated remote access stations; 3) serving as a default data center when data cannot be classified as engineering or phenomenology; and 4) maintaining the catalog of data available at the other five data centers. The catalog referred to as the "T&E Data Index" provides directory information that includes procedures and points of contact for obtaining greater detail on the SDIO Phenomenology and Engineering Data. The National Test Facility provides "data about the available data" archived at the other STDC's. The NTF is located at Falcon Air Force Base near Colorado Springs, Colorado.

Figure 1 - GEOGRAPHIC LOCATION OF SDIO DATA CENTERS

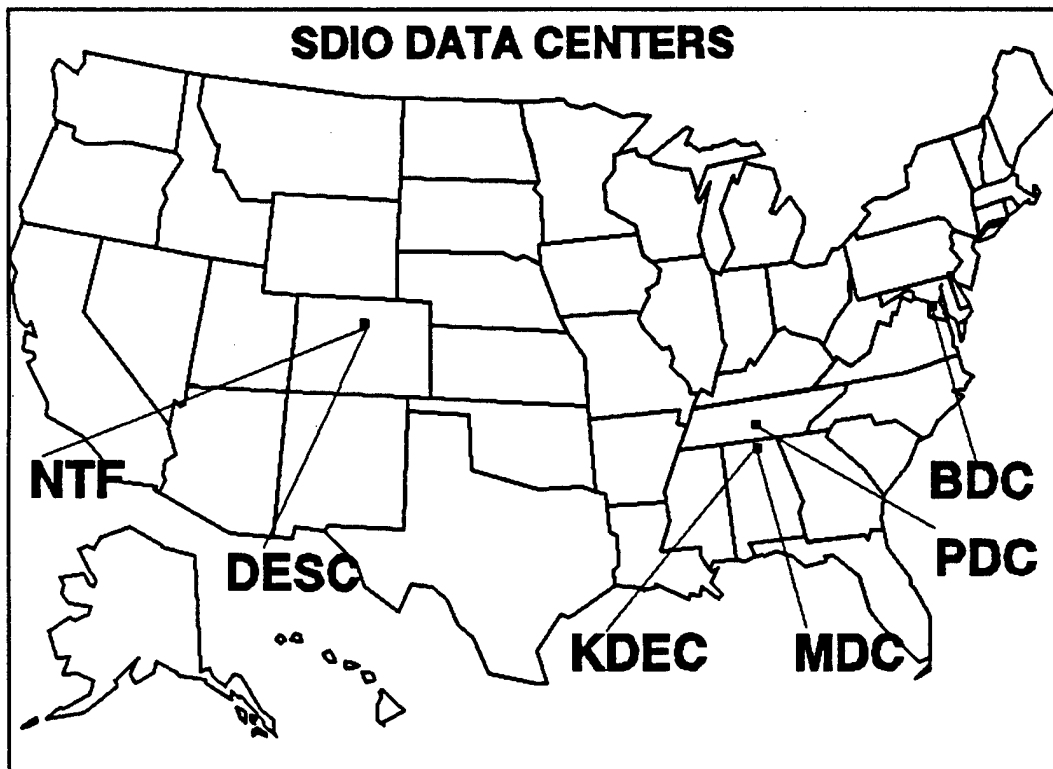
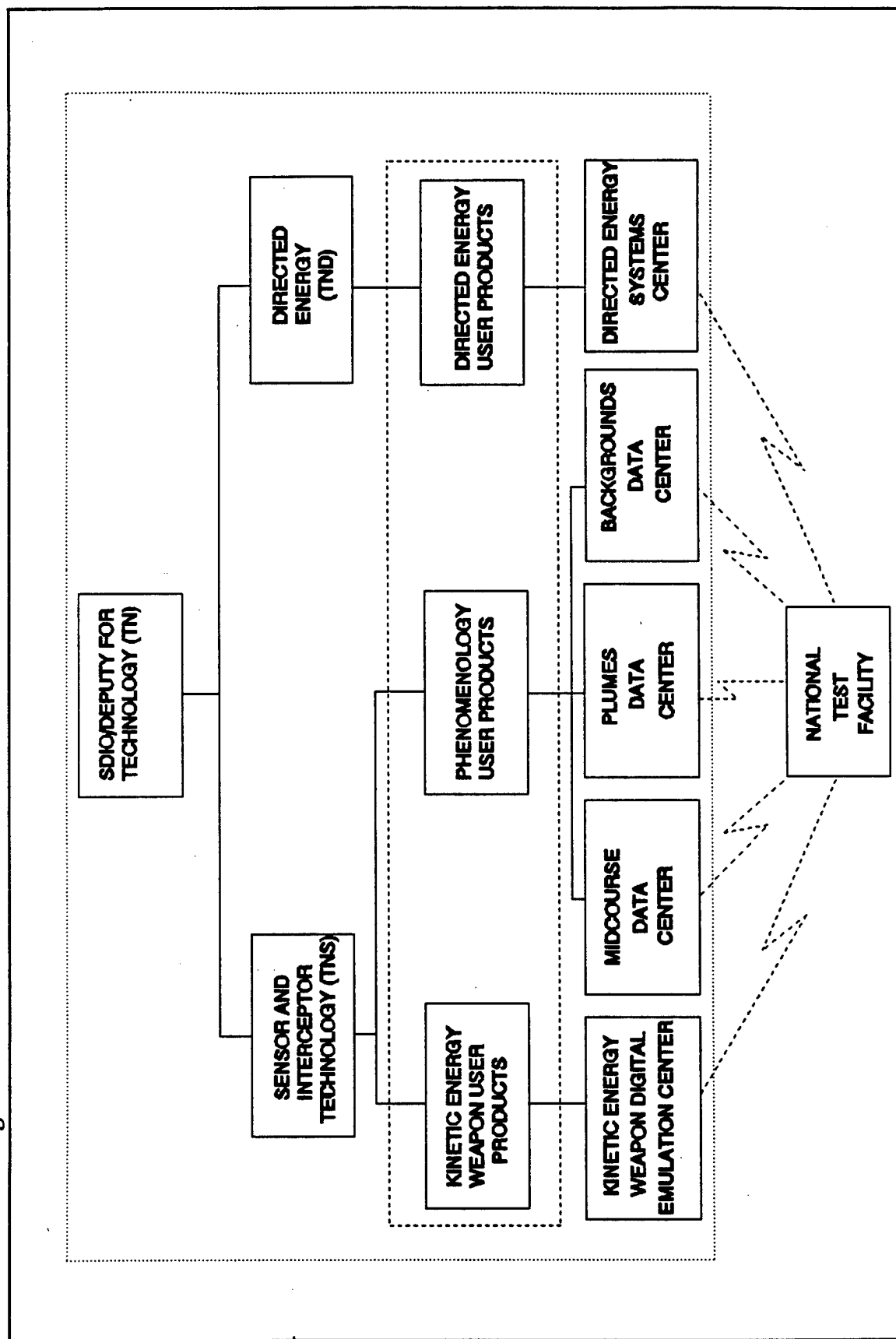


Figure 2 - ORGANIZATION CHART FOR SDIO DATA CENTER MANAGEMENT



DATA CENTER PRIMARY PRODUCTS -

The goal of the SDIO program experiments is to obtain data that will allow SDI/SDS developers to test various scenarios to determine the feasibility and practicability of developing and implementing a Strategic Defense System. Figures 3-8 are representative examples of the types of data available at the phenomenology, engineering, and NTF data centers. With these typical pictures in mind it might be helpful to know where SDIO experiment data are archived, or will be archived, for most of the larger scale experiments. To assist the user community with the archival location of data associated with a particular SDIO experiment, project, or development effort, Figure 9 contains a reference matrix exhibiting the location of archived data sets. Figure 9 is not an exhaustive listing of SDIO experiments, but a representative sample of past, present, and future experiments. The name of the experiment identifies the rows, and data center names form the column headings. An entry in a cell indicates which data center has the responsibility for archiving the data for a particular experiment. Each entry is categorized by either 'P' or 'S' which indicates whether the facility is a primary or secondary source of the archival data. A '()' indicates that the entry is projected, and a '[]' indicates the data have been archived. (Note: Secondary data can denote either redundancy of the data, or as is frequently the case, data that have been stripped from the original data set and distributed to another data center that has expertise more closely related to the nature of the segregated data set. When two primaries ('P') are listed for the same experiment it indicates that both data centers are primary, but the data that each has is mutually exclusive of the other.). This matrix should facilitate locating the correct contact to obtain permission to access a particular database when used in conjunction with **APPENDIX A - DATA MANAGEMENT CONTACTS LIST**. Due to the nature of experiments and user requirements it is expected that revisions to this matrix will be required intermittently.

Figure 3 - MDC SAMPLE DATA ILLUSTRATION



ULTRA VIOLET IMAGES OF THE MOON (U)



M-900608-05U (C) (0159)

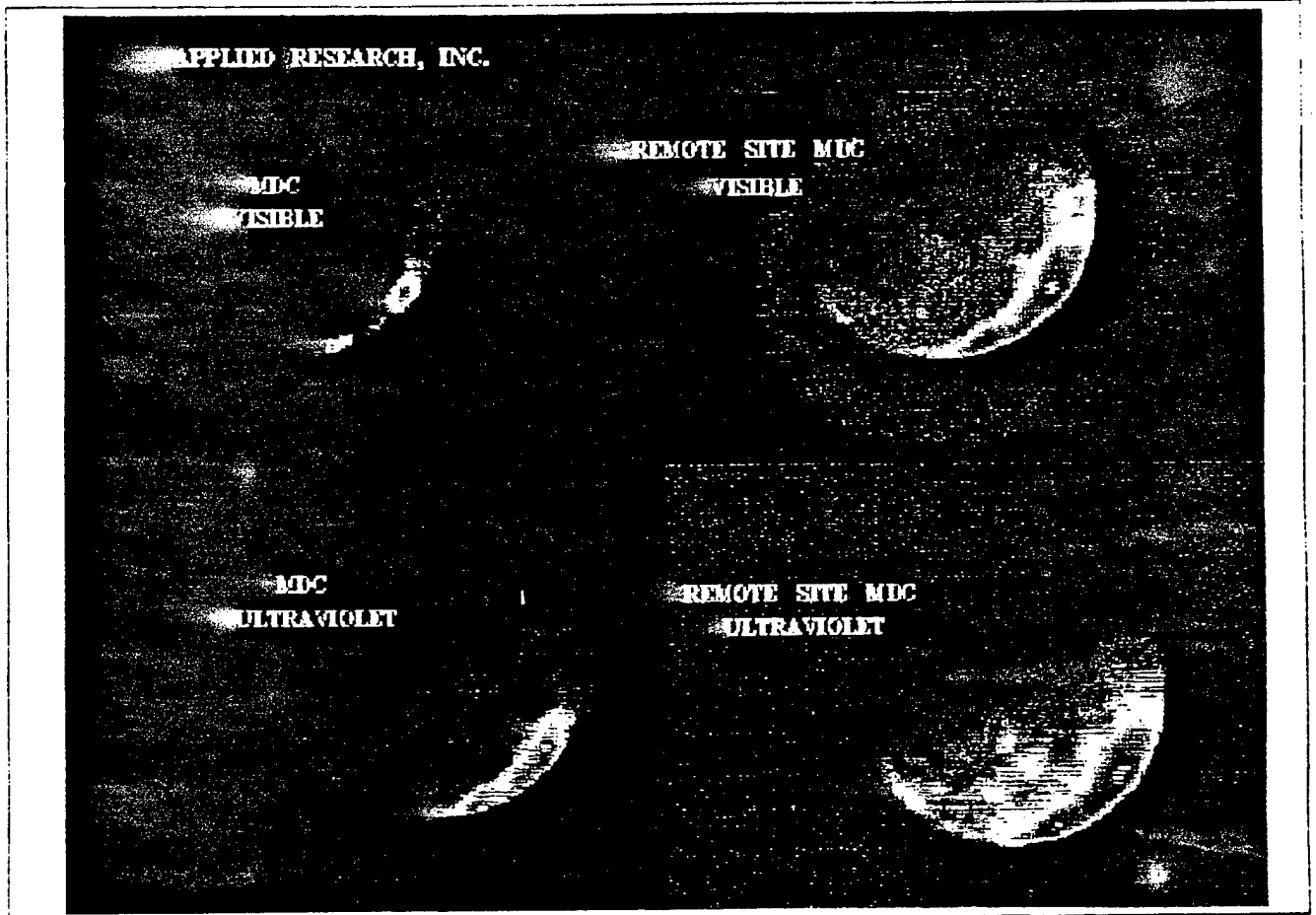


Figure 4 - BDC SAMPLE DATA ILLUSTRATION

VUE EARTH LIMB IMAGES

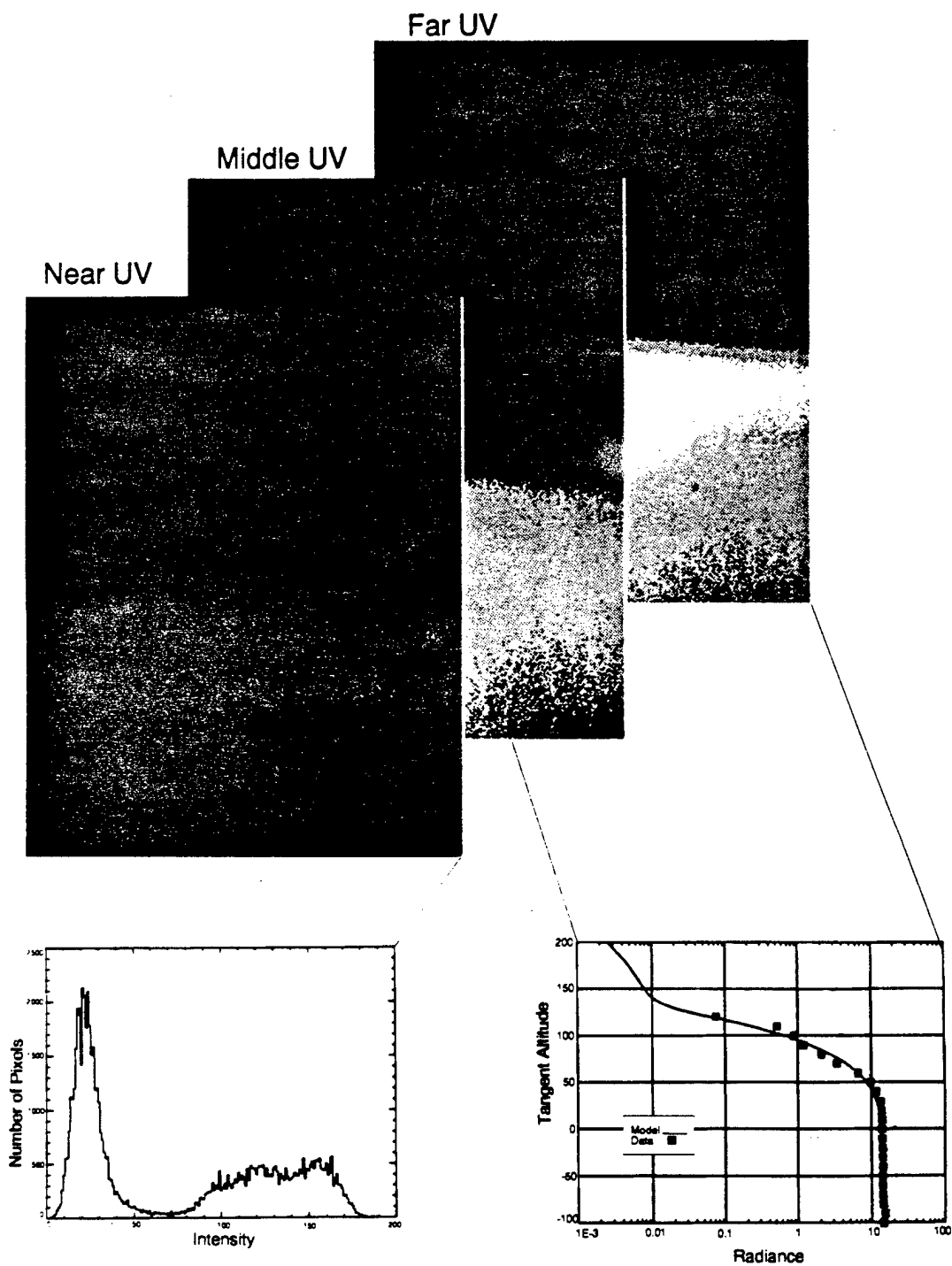


Figure 5 - PDC SAMPLE DATA ILLUSTRATION

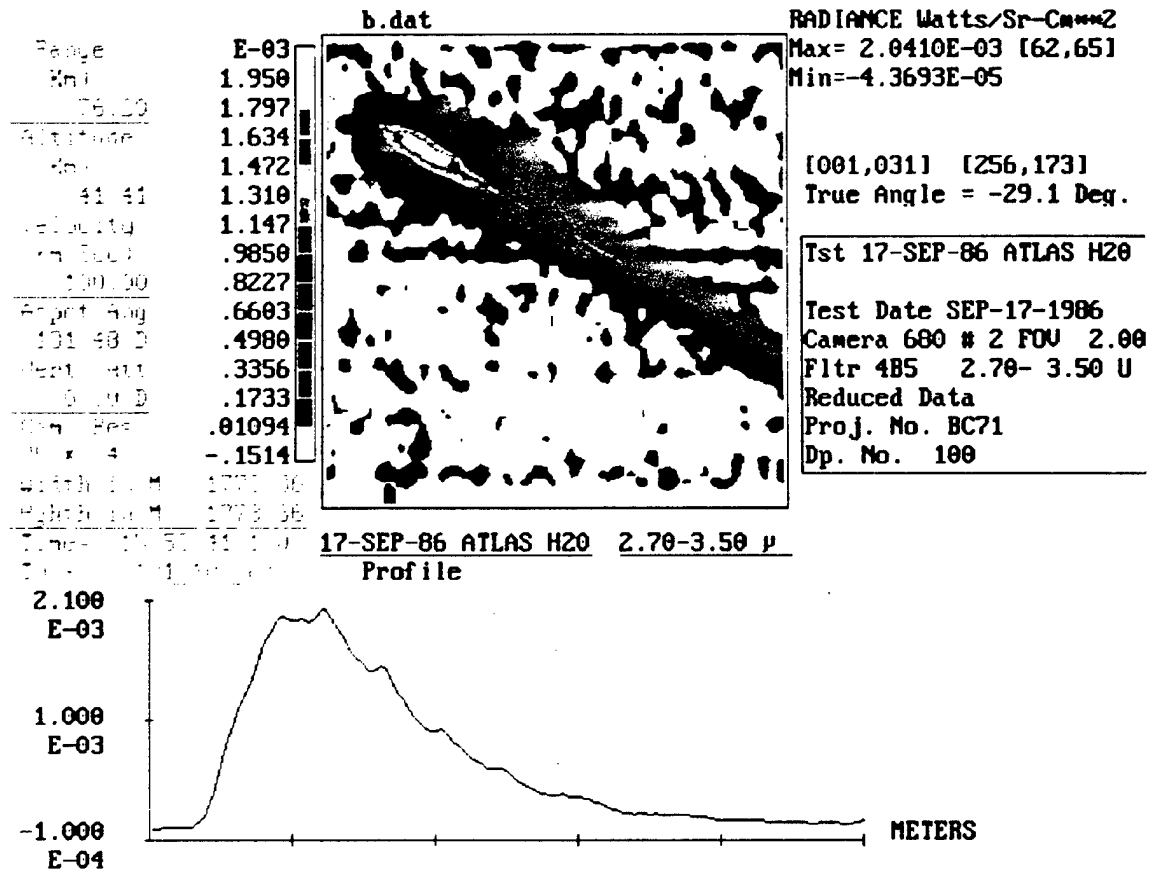


Figure 6 - KDEC SAMPLE DATA ILLUSTRATION

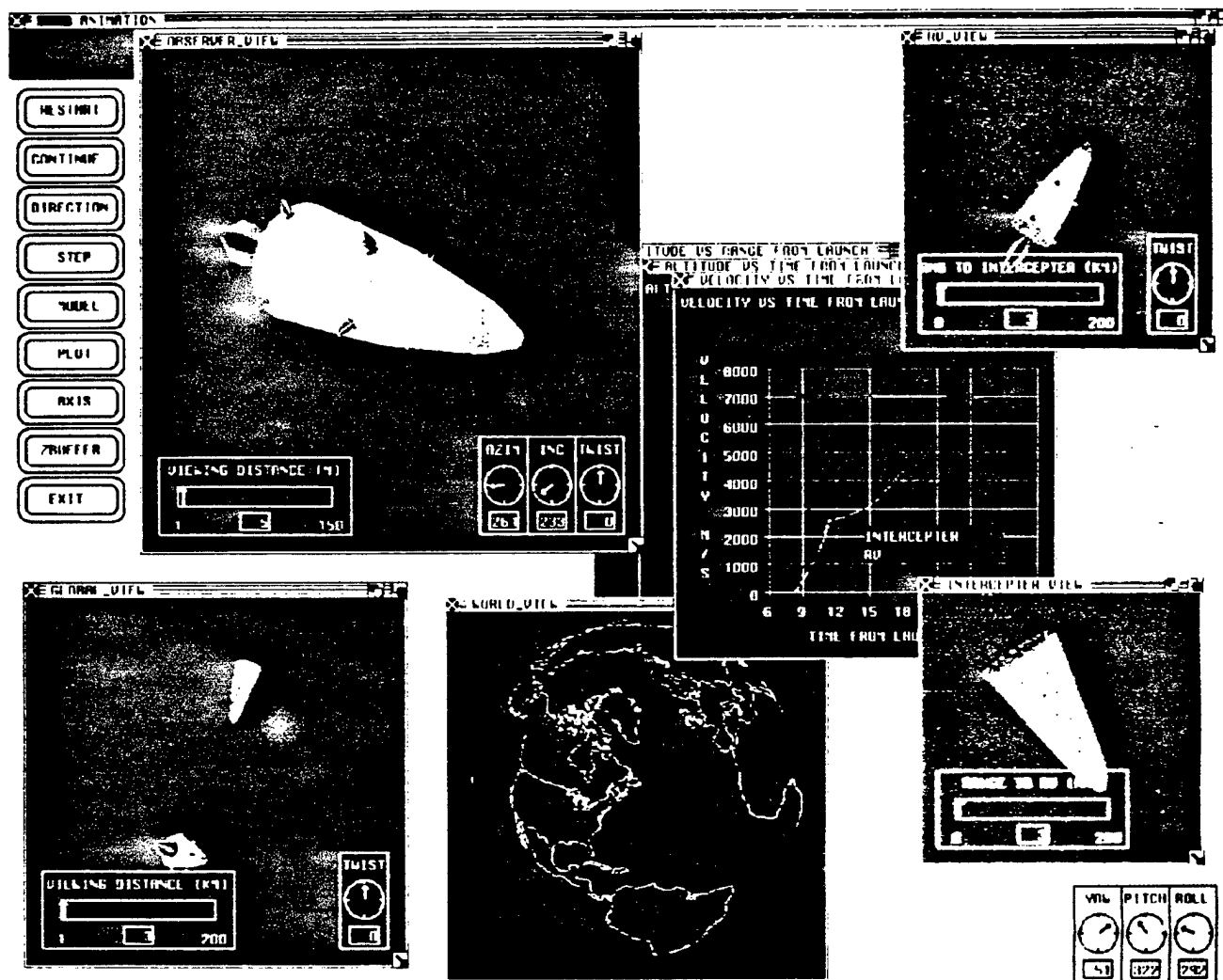


Figure 7 - DESC SAMPLE DATA ILLUSTRATION

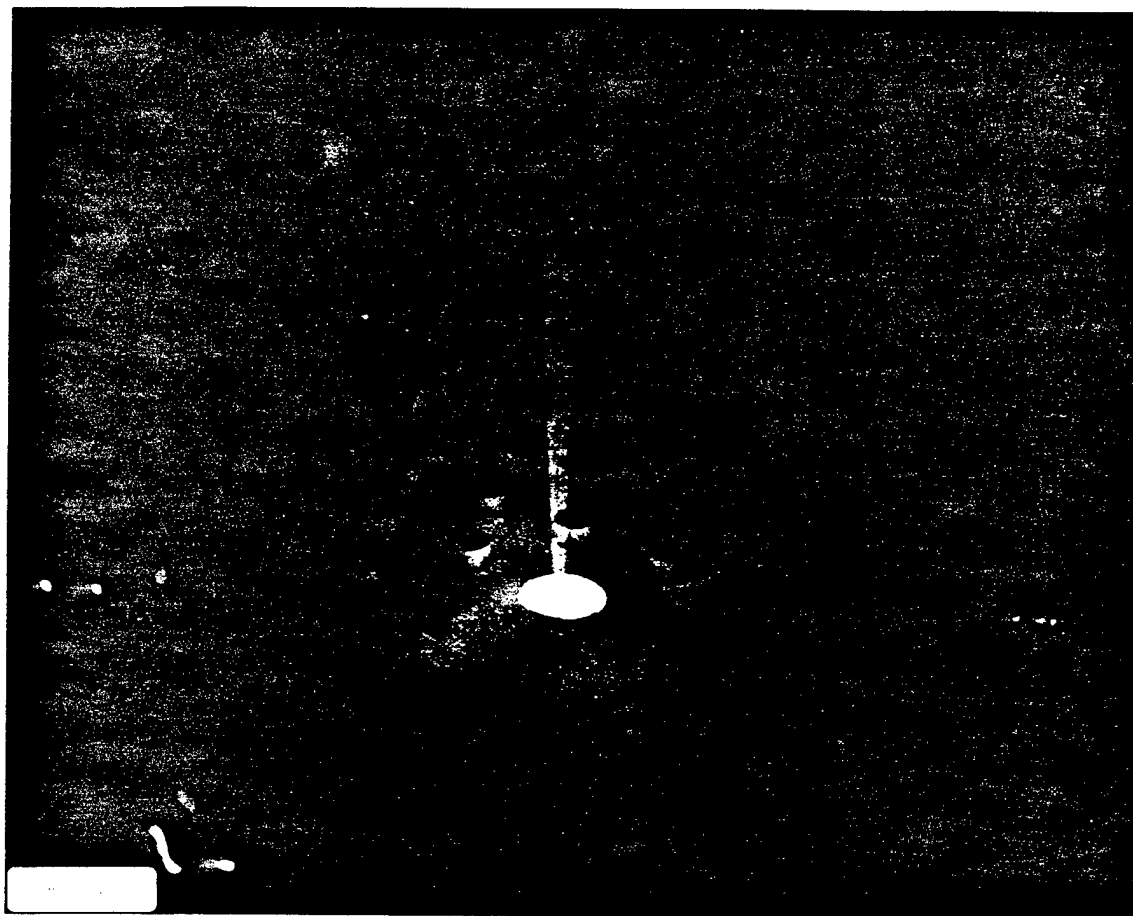
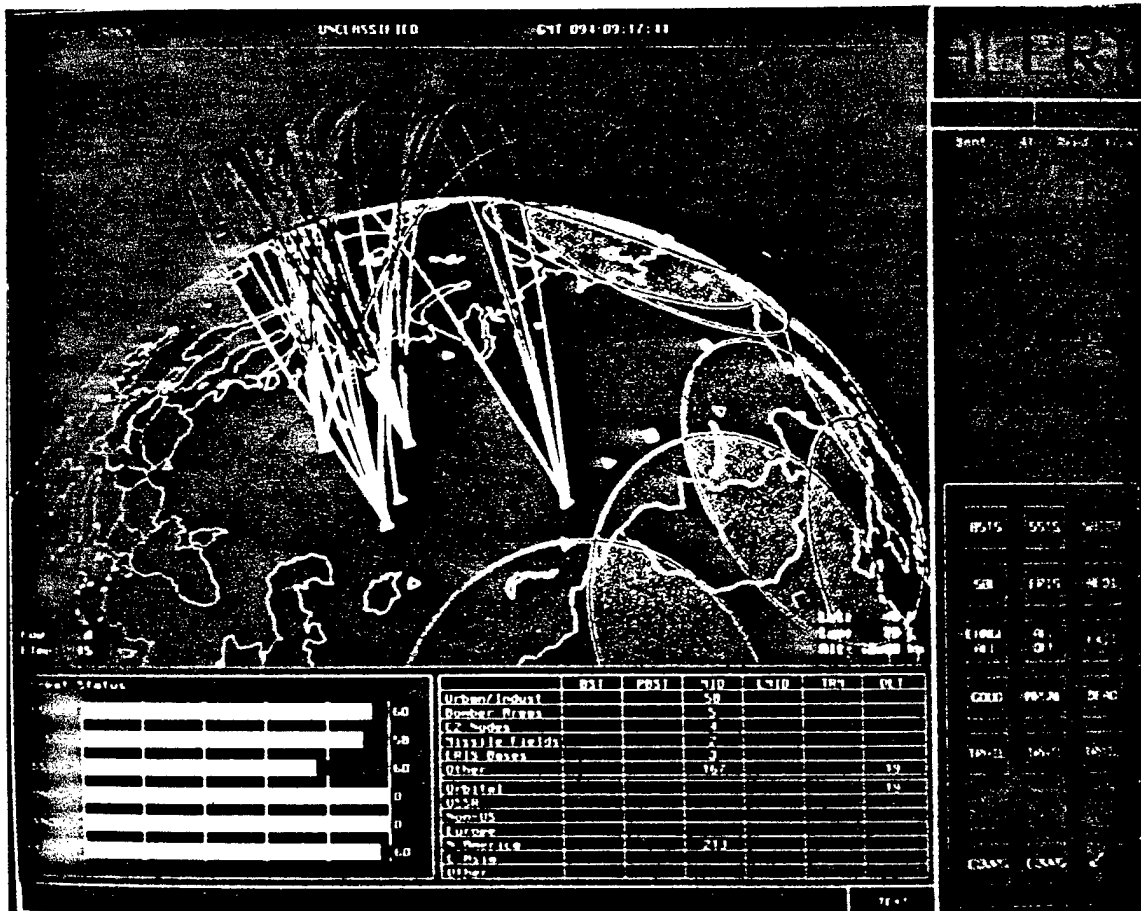


Figure 8 - NTF SAMPLE DATA ILLUSTRATION



**Figure 9 - SDIO EXPERIMENT DATA ARCHIVE
DATABASE LOCATOR**

EXPERIMENT	BDC	MDC	PDC	KDEC	DESC	NTF	OTHER
ABE	P				(S)		
ALL					P		
ALTAIR			P		P		
AMOS/MALABAR			P				
AOA/AST		P					
ARE		[P]					
ARGUS/HALO		S	P				
BEAR		[P]			(S)		
BOW SHOCK			(P)				
BRILLIANT EYES ..TBD	*	*	*	*	*	*	*
BRILLIANT PEBBLES			S	P			
CARDINAL		[P]					
CHEER		[P]					
CIRRIS 1A	P						
CLOUDS	[P]						
DELTA 180			[P]				
DELTA 181		[P]	[S]				
DELTA STAR		[P]	[S]				
EDX		(P)					

Figure 9 - continued

EXPERIMENT	BDC	MDC	PDC	KDEC	DESC	NTF	OTHER
ERIS		(P)		(P)			
EXCEDE III	P	S					
FIREBIRD			(P)		S		
FIREFLY							P
HEDI		S	S	P			
HIRAM	P						
HUP	P						
IBSS	P		S				
JANUS		[P]					
KFIT				P			
KHILS				P			
KHIT				P			
KITE				(P)			
LACE	P						
LDEF							P
LIFE I,II (LEAP)				(P)			
LOSAT-X	S	(S)	(P)				
MM ON TARGET			S	(P)			
MSX	P	S	S				
OAMP		P					

Figure 9 - continued

EXPERIMENT	BDC	MDC	PDC	KDEC	DESC	NTF	OTHER
POAM	P						
QUEEN MATCH		[P]					
RME					P		
SPIRIT II		P					
SRMP		[P]					
STARBIRD DEVL LNCH			P				
STARMATE		P					
STARS M1,M2,M3		P	S				
T&E DATA INDEX						P	
TCE	[P]		S				
ULTRASEEK	(S)	(S)	P				
UVPI	P		S				
VUE	[P]		S				
ZENITH STAR			S		P		

SUMMARY

The preceding gives an overview of the SDIO Phenomenology and Engineering Data Centers. There are many additional subjects that should be addressed if a more detailed understanding is required. Data center hardware and software configurations and appropriate user guides; standardization and issues regarding compatibility; access and security issues relating to the data centers and the data itself; data levels available and how they are defined for a particular experiment, and software procedures available for user queries are just a few subjects that the user might wish to obtain supplementary information on before any earnest data use begins. **Due to the nature of much of the SDI experiment data it is highly recommended that the prospective user first contact the appropriate data center to ensure the availability of the data.** In addition, there are data related activities located at the DoD centers of expertise that are not organizationally part of a specific data center. A primary example of this is the development of the Strategic Scene Generation Model (SSGM) located at the Naval Research Laboratory. While it is not the purpose of this summary to discuss the STDC's in great detail **APPENDIX A - DATA MANAGEMENT CONTACTS LIST** will assist the reader with obtaining additional information. **APPENDIX B - DEFINITIONS** and **APPENDIX C - ACRONYMS/ABBREVIATIONS** are provided for the convenience of the reader.

APPENDIX A

DATA MANAGEMENT CONTACTS LIST

AEDC-Plume Data Center (PDC)

Arnold Engineering Development Center/DOPR
Arnold Air Force Base, Tennessee 37389-5000
Contacts: Mr. Dale Bradley- (615) 454 4242
Fax: (615) 454-7205

Directed Energy Systems Center (DESC)

Mail Stop 82
Falcon Air Force Base, Colorado 80912-5000
Contacts: LtCol Lanny Larson- (719) 380-3287
Ms. Cynthia McDermott- (719) 380-3287
Fax: (719) 380-3274

Kinetic Energy Weapon Digital Emulation Center (KDEC)

U.S. Army Strategic Defense Command
CSSD-SA-ET
P.O. Box 1500
Huntsville, Alabama 35807-3801
Contacts: Ms. Pam Caruso- (205) 955-3507
Fax: (205) 955-3958

National Test Facility (NTF)

Information Systems Group
MS N9000
National Test Bed Joint Programs Office
Falcon AFB, Colorado 80912-5000
Contacts: Capt Bill Brecht- (719) 380-3241
Fax: (719) 380-3302
Mr. Jim Stempeck- (719) 380-3289

NRL-Backgrounds Data Center (BDC)

Naval Research Laboratory, Code 4104
Office of Strategic Phenomena
4555 Overlook Ave., SW
Washington, D.C. 20375-5000
Phone: (202) 404-7729/7730
Contacts: Dr. Harry Heckathorn (202) 767-4198
Fax: (202) 404-7296

SDC-Midcourse Data Center (MDC)

U.S. Army Strategic Defense Command (USASDC)
Adv. Tech. Directorate
P.O. Box 1500, CSSD-AT
Huntsville, Alabama 35807-3801
Contacts: Mr. Ken Magnant- (205) 955-4822
Fax: (205) 955-1432

Program Manager Phenomenology User Products SDIO/TNS

The Pentagon
Washington, D.C. 20301-7000
Contact: Capt Barry Tilton- (703) 695-8830
Fax: (703) 693-1696
or: Dr. Herbert Gursky- (202) 767-6343
Mailing Address: see Standards Committee
Fax: (202) 404-7296

Program Manager Kinetic Energy Weapon User Products SDIO/TNS

The Pentagon
Washington, D.C. 20301-7000
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Fax: (703) 693-1696

Program Manager Directed Energy User Products SDIO/TND

The Pentagon
Washington, D.C. 20301-7000
Contact: LtCol Lanny Larson- (703) 693-1568
Fax: (703) 693-1703

Data Center Standards Committee

Contacts:
Dr. Herbert Gursky- (202) 767-6343
Chairman - User Products
Naval Research Laboratory (NRL)
Code 4100, Space Sciences Division
4555 Overlook Ave., SW
Washington, D.C. 20375-5000
Fax: (202) 404-7296
or:
Mr. Ken Magnant- (205) 955-4822
Mailing Address: see Midcourse Data Center
Standards Committee Chairman - Until 10/1/91
Fax: (205) 955-1432

APPENDIX B

DEFINITIONS

Calibration -

The process of fixing or correcting the scale of a measuring instrument by comparing the instrument's measurements of known objects with published standard values for these objects.

Data Center Manager -

The executing agent representative responsible for the overall technical and administrative management of an SDIO Engineering or Phenomenology Data Center, or the NTF.

Data Reduction -

Transformation of raw observed values into useful, ordered, or simplified information; the process by which data are converted to scientific/engineering units, filtered for gross anomalies, and scaled/smoothed to meet processing requirements. For engineering tests the reduced data shall measure system performance capabilities. For phenomenological measurements, the data shall reveal knowledge about the target signatures as well as the sensor transfer function.

Data Validation -

Assessment of the correctness and accuracy of experiment data using external sources, knowledge of the physical processes being examined and the capabilities of the system and measuring instrument.

Data Verification -

Assessment of experiment data based on knowledge of the proper operation of the measuring instrument, data recording, and telemetry systems (i.e. Did the sensor and instrumentation operate correctly).

Engineering Data -

Measurements describing the performance of hardware and software associated with systems and components of interest to SDIO such as performance measurements of rocket motors, warheads, and lasers; ultraviolet, visible, and infrared sensors; guidance and control systems; kinetic energy weapons; directed energy weapons; and surveillance, acquisition, tracking, pointing, homing, kill assessment, command, control, and communications intelligence systems.

Experiment -

Any action, operation, or process managed under controlled conditions in order to discover something not yet known, to demonstrate something known, to evaluate the validity of a hypothesis, or to test the efficacy of something previously untried. In the context of this Directive it also includes any test, evaluation, or demonstration funded or controlled by SDIO.

Experiment Data -

Numerical information representing the measurements which resulted from an experiment, test, evaluation, or demonstration. Many scientists and engineers recognize five levels of experiment data:

Level 0 Experiment Data - Uncalibrated telemetry or other uncalibrated test data as recorded directly from the measuring instrument(s). This level represents data recorded on analog or digital media and consists of electrical readings in either discrete or analog form, but totally unprocessed.

Level 1 Experiment Data - Measurement data which have been converted to digital form either directly from the recording instrument or by digitizing analog media. These data will be in raw (uncalibrated) counts and will represent the data as originally recorded, only in digital form. Level 1 data are organized in proper time

order, separated by instrument, with a complete copy of housekeeping information and geometric positioning information as recorded in the telemetry.

Level 2 Experiment Data - Data which have been converted from uncalibrated counts or instrument readings to scientific or engineering physical units. These units are derived from the application of calibration algorithms to the uncalibrated data. Level 2 data have been checked for data quality and correctness, but not for information content. The final Level 2 data are stored as verified and validated.

Level 3 Experiment Data - Information resulting from the initial analysis of the data intended to correlate the various measurements with pertinent physical parameters. Level 3 data are intended to answer the question: "Does the information derived correspond to previously known properties and predictions of the event observed", or "What new insights do the data provide".

Level 4 Experiment Data - Data used for model evaluation, answering critical questions and issues, system feasibility assessments, and decision making.

National Test Bed (NTB) -

Computer Systems and associated hardware that are used to simulate component parts of the SDS for the purpose of determining feasibility, testing, and validating operational and technical concepts. Allows developers to compare, evaluate, and test alternative architectures; satisfy command center/system operation and integration functions (CC/SOIF); and provide simulations for a Strategic Defense System.

Phenomenology Data -

Measurements of the statics and dynamics of active and passive signatures associated with natural and manmade processes of interest to SDIO systems such as the measured behavior of missile plumes, missile hard bodies, post-boost vehicles, midcourse objects, reentry vehicles, replicas, decoys, as well as the background of hard earth, clouds, atmosphere, earthlimb, celestial space, nuclear blasts, fuel vents, auroral events and other perturbations to the natural environment.

STDB -

(SDIO Science and Technology Database) a collection of phenomenology and technology engineering experiment data stored at the various data centers and viewed as one logical database.

Strategic Scene Generation Model (SSGM) -

A computerized methodology which integrates state-of-science knowledge, databases, and computerized phenomenological models to simulate strategic engagement scenarios in order to support the design, development, and testing of strategic defense systems and components. Multi-phenomenology scenes are produced from validated computer programs (codes) - thereby serving as a standard against which different SDI concepts and designs can be tested. The SSGM provides modeled data in the form of digital realizations of complex, dynamic scenes.

Test -

Any action, operation, or process conducted to resolve an uncertainty about an idea or system through critical examination, observation, measurement, or trial.

T&E Data Index -

A centralized directory located at the NTF which provides information about geographically distributed test, evaluation, and experiment data. The directory contains information on data located at SDIO data centers and includes points of contact for obtaining additional information on the data. Prior to July 1990, the catalog was referred to as the "yellow pages".

APPENDIX C

ACRONYMS/ABBREVIATIONS

ABE-	ARMY Background Experiment
ALL-	Airborne Laser Lab
ALTAIR-	Acquisition & Pointing Experiments
AMOS/MALABAR-	Ground Observation Sites
ARE-	Aerothermal Reentry Experiment
AOA/AST-	Airborne Optical Adjunct
ARGUS/HALO-	SDI Observation Aircraft
BEAR-	Beam Experiment Aboard A Rocket
BOW SHOCK-	Boost Phase Experiments
CARDINAL-	Targets Program
CHEER-	Chemical Release Experiment
CIRRIS 1A-	Cryogenic IR Radiance Instrumentation for Shuttle
CLOUDS-	Meteorological Cloud Data
DELTA 180	Kinetic Energy Weapon Space Experiment
DELTA 181-	Kinetic Energy Weapon Space Experiment
DELTA STAR-	Special Project Office Space Experiment
EDX-	Exo-atmospheric Discrimination Experiment
ERIS-	Exo-atmospheric Reentry Vehicle Interceptor Subsystem
EXCEDE III-	Electron Accelerator Experiment III,IV; Excitation by Electron Deposition
FIREBIRD-	Firebird Sounding Rocket Experiment
FIREFLY-	Firefly Sounding Rocket Experiment
GB-	Ground Based
HEDI-	High Endo-atmospheric Interceptor
HIRAM-	High Resolution Auroral Measurement
HUP-	Horizon UV Program
IBSS-	Infrared Background Signature Survey
JANUS-	Sensors and Interceptors Office Space Experiment
KFIT-	Kinetic Energy Weapon Flight Integration Tests
KHIL-	Kinetic Energy Hardware-In-The-Loop
KHIT-	Kinetic Energy Hover Interceptor Test
KITE-	Kinetic Energy Kill Vehicle Integrated Technology Exp.(HEDI KITE Experiments 2,3)
LACE-	Low-powered Atmospheric Compensation Experiment
LDEF-	Long Duration Exposure Facility
LIFE-	AIR FORCE LEAP Integrated Flight Experiment Program I,II
LOSAT-	Special Projects Office Space Experiment
MM ON TARGET-	Space-based Interceptor Hover Test
MSX-	Midcourse Space Experiment
OAMP-	Optical Airborne Measurement Program
POAM-	Polar Ozone Aerosol Measurement
QUEEN MATCH-	Sounding Rocket Experiment
RME-	Relay Mirror Experiment
SPIRIT-	Space Infrared Imaging Telescope; Spatial IR Rocketbourne Interferometric Telescope
SRMP-	Sounding Rocket Measurement Program
SSGM-	Strategic Scene Generator Model
STARBIRD-	(Development Launch) Booster System
STARMATE-	Survivability Space Experiment
STARS-	Strategic Targets System

TCE-	Three Color Experiment
ULTRASEEK-	Ultraseek Flight Experiment
UVPI-	Ultraviolet Plume Experiment
VUE-	Visible and Ultraviolet Experiment
ZENTH STAR-	Integration of Alpha Laser, LODE, LAMP Chemical Laser Experiment